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Title: Monte Carlo Simulations for Time-of-Flight Epithermal Neutron Activation Analysis for Isotopic Signatures

Abstract

This work is focused on designing a novel mechanical neutron chopper that is currently being designed at the Penn State's Breazeale Reactor. This neutron chopper, in conjunction with a dedicated time-of-flight (TOF) system, is anticipated to create pulses of nearly monochromatic neutrons up to 40 eV, with a 2% energy resolution or better. This unique source of neutrons based on a piston-based mechanical neutron chopper is modeled with TOF epithermal neutron activation analysis (ENAA) of materials of interest. The advantage of nearly monochromatic ENAA is the ability to exploit isotopic signatures, rather than just elemental. In the past, discretized, time-dependent pulses created from un-filtered neutrons exiting the reactor beamline have been modeled with MCNP6. The current MCNP6 simulation efforts are focused on assessing the expected performance of the neutron chopper and its quantitative impact on ENAA. The ongoing study of unique isotopic resonances in the energy range of 0.1 to 40 eV will inform the material selection for the simulations. During the MTV Workshop, the expected TOF ENAA system performance will be discussed in detail.